

Claims

What is claimed is:

1. A method of controlling a variable valve actuation system for an engine, comprising:
 - operating a cam assembly to move an intake valve between a first position where the intake valve blocks a flow of fluid and a second position where the intake valve allows a flow of fluid;
 - sensing a parameter indicative of an altitude at which the engine is operating;
 - accessing a first lookup map to determine a desired air-to-fuel ratio when the sensed parameter indicates that the engine is operating at an altitude below a first predetermined value;
 - accessing a second lookup map to determine a desired air-to-fuel ratio when the sensed parameter indicates that the engine is operating at an altitude above the first predetermined value;
 - determining a desired valve actuation period based on the determined air-to-fuel ratio;
 - preventing the intake valve from returning to the first position in response to operation of the cam assembly; and
 - allowing the intake valve to return to the first position at the end of the determined valve actuation period.
2. The method of claim 1, further including accessing a third lookup map to determine a desired air-to-fuel ratio when the sensed parameter is indicates that the engine is operating at an altitude above a second predetermined value.

3. The method of claim 2, wherein the first predetermined value is approximately 1700m and the second predetermined value is approximately 3000m.

4. The method of claim 1, wherein the sensed parameter is a pressure representative of the atmospheric pressure.

5. The method of claim 1, wherein the desired valve actuation period is determined as a function of an engine speed, an intake air pressure, and the desired air fuel ratio.

6. The method of claim 1, wherein the desired valve actuation period is determined in terms of a crankshaft rotational angle at which the valve actuator is to be released.

7. The method of claim 6, wherein the valve actuation period extends the closing of the intake valve by a predetermined number of degrees of a rotation of a crankshaft.

8. The method of claim 1, wherein each of the first and second lookup maps store the air-to-fuel ratio as a function of an engine speed and a fuel injection quantity and the method further includes:

- sensing a speed of the engine;
- sensing a load on the engine; and
- calculating a fuel injection quantity.

9. An intake valve actuation system for an engine, comprising:

- an intake valve moveable between a first position where the intake valve prevents a flow of fluid and a second position where the intake valve allows a flow of fluid;

a cam assembly connected to the intake valve to move the intake valve between the first position and the second position;

a valve actuator selectively operable to prevent the intake valve from returning to the first position;

a sensor operable to sense a parameter indicative of an altitude at which the engine is operating; and

a controller having a memory adapted to store a first lookup map and a second lookup map, the controller operable to access the first lookup map to determine a desired air-to-fuel ratio when the sensed parameter indicates that the engine is operating at an altitude below a first predetermined value and to access the second lookup map to determine a desired air-to-fuel ratio when the sensed parameter indicates that the engine is operating at an altitude above the first predetermined value, the controller further operable to determine a desired valve actuation period based on the determined air-to-fuel ratio and to prevent the intake valve from returning to the first position until the end of the determined valve actuation period.

10. The system of claim 9, wherein the memory is adapted to store a third lookup map and the controller accesses the third lookup map when the sensed parameter indicates that the engine is operating at an altitude above a second predetermined value.

11. The system of claim 10, wherein the memory of the controller is adapted to store

a fourth lookup map defining the desired air-to-fuel ratio when the engine is experiencing transient conditions and the sensed parameter indicates that the engine is operating at an altitude below the first predetermined value; and

a fifth lookup map defining the desired air-to-fuel ratio when the engine is experiencing transient conditions and the sensed parameter indicates

that the engine is operating at an altitude above the first predetermined value and below the second predetermined value; and

a sixth lookup map defining the desired air-to-fuel ratio when the engine is experiencing transient conditions and the sensed parameter indicates that the engine is operating at an altitude above the second predetermined value.

12. The system of claim 10, wherein the first predetermined value is approximately 1700m and the second predetermined value is approximately 3000m.

13. The system of claim 9, wherein the sensor is a pressure sensor adapted to sense a pressure representative of the atmospheric pressure.

14. The system of claim 9, wherein each of the first and second lookup maps define the desired air-to-fuel ratio as a function of an engine speed and a fuel injection quantity.

15. The system of claim 14, further including a second sensor adapted to sense a speed of the engine and a third sensor adapted to sense a load on the engine and wherein the controller is adapted to determine the fuel injection quantity based on the engine speed and the engine load.

16. An engine, comprising:
an engine block defining at least one cylinder;
a piston slidably disposed within the at least one cylinder;
an intake valve moveable between a first position where the intake valve prevents a flow of fluid to the at least one cylinder and a second position where the intake valve allows a flow of fluid to the at least one cylinder;
a cam assembly connected to the intake valve to move the intake valve between the first position and the second position;
a valve actuator selectively operable to prevent the intake valve from returning to the first position;

a sensor operable to sense an operating parameter of the engine;
and

a controller having a memory adapted to store a first lookup map and a second lookup map, the controller operable to access the first lookup map to determine a desired air-to-fuel ratio when the sensed parameter indicates that the engine is operating at an altitude below a first predetermined value and to access the second lookup map to determine a desired air-to-fuel ratio when the sensed parameter indicates that the engine is operating at an altitude above the first predetermined value, the controller further operable to determine a desired valve actuation period based on the determined air-to-fuel ratio and to prevent the intake valve from returning to the first position until the end of the determined valve actuation period.

17. The engine of claim 16, wherein the memory is adapted to store a third lookup map and the controller accesses the third lookup map when the sensed parameter indicates that the engine is operating at an altitude above a second predetermined value.

18. The engine of claim 17, wherein the memory of the controller is adapted to store

a fourth lookup map defining the desired air-to-fuel ratio when the engine is experiencing transient conditions and the sensed parameter indicates that the engine is operating at an altitude below the first predetermined value; and

a fifth lookup map defining the desired air-to-fuel ratio when the engine is experiencing transient conditions and the sensed parameter indicates that the engine is operating at an altitude above the first predetermined value and below the second predetermined value; and

a sixth lookup map defining the desired air-to-fuel ratio when the engine is experiencing transient conditions and the sensed parameter indicates that the engine is operating at an altitude above the second predetermined value.

19. The engine of claim 17, wherein the first predetermined value is approximately 1700m and the second predetermined value is approximately 3000m.

20. The engine of claim 16, wherein the sensor is a pressure sensor adapted to sense a pressure representative of the atmospheric pressure.

21. The engine of claim 16, wherein each of the first and second lookup maps define the desired air-to-fuel ratio as a function of an engine speed and a fuel injection quantity.

22. The engine of claim 21, further including a second sensor adapted to sense a speed of the engine and a third sensor adapted to sense a load on the engine and wherein the controller is adapted to determine the fuel injection quantity based on the engine speed and the engine load.